

AFRIROCK

PIONEERING PROGRESS : THE FUTURE OF ROCK ENGINEERING

VENUE: Sun City, Rustenburg, South Africa

20 JULY 2025 – Geotech: Stress Measurements,
Hydrofracturing and Earthquake Inhibitors

TIME: 13:00-17:00



Geotech: Stress Measurements, Hydrofracturing and Earthquake Inhibitors **20 July 2025 | Time: 13:00-17:00**

Since 1990s, Japanese and South African geophysicists and geoengineers have collaborated to understand the underlying processes of seismic events induced by mining activities. Important factors include the stress state in the rock mass and its disturbance associated with mining. Therefore, three stress measurement methods (DCDA_{a,f}, CCBO_c, g, h and DRA_i) and strain monitoring instruments developed in Japan were implemented in deep gold mines by Science and Technology Research Partnership for Sustainable Development (SATREPS) program (2009-2015) and the Drilling into seismogenic zones of M2.0-M5.5 earthquakes in deep South African gold mine (ICDP-DSeis) project (2016-present). Recently, Tohoku University invented new technologies using a special fluid called STF (Strain Thickening Fluid) that makes it possible to create multi-directional hydrofractures and inhibit seismic events. This means that STF has potential to improve the safety of deep mines and enhance productivity of shale gas/oil, as well as capacity of CO₂ storage.

We are establishing a Geotech Consortium to accelerate the transfer of the above-mentioned geotechnologies not only to deep mining but also to the shale gas development project in Karoo basin. Further, the consortium aims to maintain their technical standards and improve them through mutual communication between academia and industry. To achieve these objectives, the consortium organizes workshops to educate and foster technicians and students. On the occasion of AfriRock 2025, SANIRE kindly offered the Geotech Consortium an opportunity to hold a kick-off workshop. The outline, basic theory and practice of these methods and techniques will be presented by their inventors in the workshop. We welcome the AfriRock participants to join the workshop

Establishing committee of Geotech Consortium

- ITO Takatoshi (Chair, Tohoku University)
- DURRHEIM Raymond (University of the Witwatersrand)
- FUNATO Akio (Fukada Geological Institute)
- KANDA Mpoyi Jacques (University of the Witwatersrand)
- KATO Harumi (3D Geoscience)
- MUKUHIRA Yusuke (Tohoku University)
- OGASAWARA Hiroshi (Ritsumeikan University)
- SAKAGUCHI Kiyotoshi (Tohoku University)
- WATSON Bryan (University of the Witwatersrand)
- YABE Yasuo (Secretary, Tohoku University)

FOR FURTHER INFORMATION, CONTACT:

Gugu Charlie,
Conferences and Events
Coordinator

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ECSPA and SACNASP Validated CPD Activity
Credits = 0.1 per hour attended

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Agenda of the workshop

Chairperson: Eric Saffou, University of the Witwatersrand

1	13:00-13:05	Opening remarks	Kevin Le Bron (SANIRE President)
2	13:05-13:15	Concept of Geotech Consortium	Yasuo Yabe
3	13:15-13:45	Diametrical Core Deformation Analysis (DCDA) and Dual-Bit Coring (DBC)	Takatoshi Ito
4	13:45-14:15	Compact Conical-ended Borehole Overcoring (CCBO)	Kiyotoshi Sakaguchi
5	14:15-14:35	A case study of stress estimation by integrating various stress indicators	Yasuo Yabe
6	14:35-15:15	Geotechnologies based on Strain Thickening Fluid (STF) 6-1. Multi-directional hydrofracturing 6-2. Seismic event inhibitor	Yusuke Mukuhira
	15:15-15:35	Break	
7	15:35-15:55	Importance of stress measurement/modeling	Gerhard Hofmann (AngloGold Ashanti)
8	15:55-16:15	Hydrofracturing as a stress management method	Dave Roberts (Sibanye Stillwater)
9	16:15-16:35	Role of South African Universities	Raymond Durrheim
10	16:35-16:55	Role of South African National Institutes	Willem Meintjes
11	16:55-17:00	Closing remarks	William Joughin (SRK Consulting)

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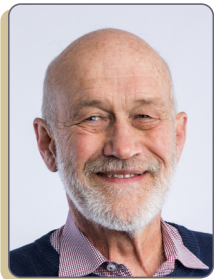
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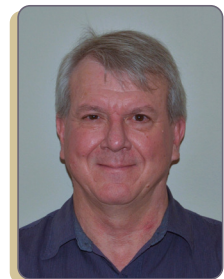


Workshop Presenters:



Raymond Durrheim

Raymond Durrheim (PhD, Witwatersrand, 1990) is a Professor in the School of Geosciences, University of the Witwatersrand, Johannesburg. He held the South African Research Chair in Exploration, Earthquake and Mining Seismology from 2007 until his retirement in 2021. He was appointed on a post-retirement contract and continues to co-direct the AfricaArray research and capacity-building program, lead the DSI-NRF-SAIMM Community of Practice in Knowledge & Skills Development for Oil & Gas Exploration & Production, and is a principal investigator of the ICDP project Drilling into Seismogenic Zones of M2.0 – M5.5 Earthquakes in Deep South African Gold Mines (DSeis, 2016-present). Ray is the author or co-author of more than 200 refereed articles published in journals, conference proceedings and books, and co-recipient of the Society of Exploration Geophysics Award for the Best Paper Published in Geophysics in 2012. In 2021, Ray received two NSTF-South32 “Science Oscars”: the Lifetime Award for his outstanding contribution to science, engineering and technology (SET) and innovation in South Africa, and was a member of the Wits School of Geosciences team that won the Data for Research Award



Hofmann Gerhard

Gerhard obtained his M. Sc. Physics at the University of Stellenbosch, South Africa, in 1995. He was then employed by ISS International, initially in the Geophysics group and later in the Mine Seismology Division. Here he was involved in research and development of seismic hazard assessment techniques, including boundary element numerical modelling to assess the stability of geological structures in the deep level tabular mining environment. In 2009 he joined AngloGold Ashanti as Senior Mine Seismologist, in the South African central Rock Engineering Group, providing an in-house design and research function. He obtained the Graduate Diploma in Engineering at the Witwatersrand University School of Mining in 2013. In 2018, he transferred to the International Geotechnical Engineering Group, where he currently is, contributing to rock damage back-analyses and implementing numerical modelling and seismic hazard assessment methodologies at the operations in Africa, Brazil and Australia. During his time with AngloGold Ashanti he also collaborated on the Japanese supported research programs in the South Africa gold mines, especially in-situ stress measurements using the CCBO (Compact Conic-ended Borehole Overcoring) technique. He implemented the stress measurement technique at other mine sites, conducting campaigns in Tanzania, Ghana, Brazil and Australia.



Ito Takatoshi

Ito Takatoshi is now Professor of Geomechanics, Institute of Fluid Science, Tohoku University, Japan, since January 2010. He stayed temporarily at Stanford University to work with Professor Zoback from 1997 to 1998. He was involved in the National project of methane hydrate development in Japan from 2006 to 2023. He has been leading now the project developing a new stress measurement method applicable to deep and high temperature wells, funded by NEDO, a national research and development agency in Japan. His research interests include fracturing in unconsolidated sands, sand production, CO₂ geological storage, geomechanical approach to oil, natural gas and geothermal energy development, and in-situ stress measurements.

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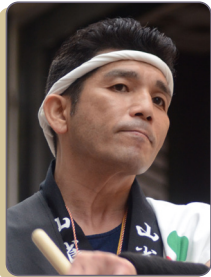
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Yusuke Mukuhira

Yusuke Mukuhira graduated from the Department of Environmental Science, Graduate School of Environmental Science, Tohoku University, and obtained PhD in March 2013. After working as a JSPS Research Fellow PD at the Institute of Fluid Science, Tohoku University, and a JSPS Overseas PD at MIT, he became an assistant professor at the Institute of Fluid Science, Tohoku University in 2017. He was recently promoted to associate professor.

His specialties are geophysics and rock mechanics. He is interested in underground fluids and fracture phenomena and conducts research activities, focusing mainly on microearthquakes in geothermal fields and earthquakes in resource engineering. He has recently begun laboratory rock experiments to control underground flow actively.



Kiyotoshi Sakaguchi

Kiyotoshi Sakaguchi is a Professor in Graduate School of Environmental Studies, Tohoku University, Sendai, Japan. He acted as Secretary General of Japanese Society for Rock Mechanics (JSRM) from 2013 to 2015 and Vice President from 2019 to 2021. He is one of the developers of the CCBO method, and the results of his work were compiled in his doctoral thesis (Ph.D. in Engineering, Kumamoto University, 1994). He has published interesting findings on shallow crustal stress variations before and after the 2011 off the Pacific coast of Tohoku Earthquake (Mw 9.0) based on rock stress measurements using the CCBO method over a period of approximately 25 years. For these results, he received the ISRM Outstanding Paper Award in 2014 and the JSRM Paper Award in 2019.



Yasuo Yabe

Yasuo Yabe (PhD, Tohoku University, 2004) is an Associate Professor in Graduate School of Science, Tohoku University, Sendai, Japan. He is an Executive Committee member of the Japan Drilling Earth Science Consortium (J-DESC). He is a principal investigator of the ICDP project Drilling into Seismogenic Zones of M2.0 – M5.5 Earthquakes in Deep South African Gold Mines (DSeis, 2016-present) and lead proponent of a new ICDP project Probing the heart of an earthquake and life in the deep subsurface (PROTEA). He is the author or co-author of more than 80 refereed articles published in journals and conference proceedings, and co-recipient of Frontier Award of the Japanese Society for Rock Mechanics in 2016 and the Best Paper Award of the Seismological Society of Japan in 2013.

Registration Fee: R2 000

Online: R1 000

Students: Free (Proof of full time student status required)

Geotech Workshop combined with Rocscience Workshop: R3 000

REGISTER HERE

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